

**Appln No. 10/688,781**  
**Amdt date March 19, 2007**  
**Reply to Office action of December 18, 2006**

**Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application.

**Listing of Claims**

Please amend claims 9 and 14.

1. (Previously Presented) A negative electrode for a lithium sulfur battery comprising:
  - a lithium metal;
  - a pre-treatment layer formed on the lithium metal, the pre-treatment layer having a thickness of 50 to 5000Å and including a lithium ion conductive material with an ionic conductivity of at least  $1 \times 10^{-10}$  S/cm, wherein the lithium ion conductive material is  $\text{Li}_x\text{PO}_y$ , where  $2 < x < 4$  and  $3 < y < 5$ ; and
  - a protection layer for the lithium metal.
2. (Canceled).
3. (Previously Presented) The negative electrode of claim 1, wherein the lithium ion conductive material is  $\text{Li}_3\text{PO}_4$ .
4. (Original) The negative electrode of claim 1, wherein the ionic conductivity of the lithium ion conductive material ranges from  $1 \times 10^{-10}$  S/cm to  $1 \times 10^{-6}$  S/cm.
5. (Previously Presented) A negative electrode for a lithium sulfur battery comprising:
  - a lithium metal;

**Appln No. 10/688,781**

**Amdt date March 19, 2007**

**Reply to Office action of December 18, 2006**

a pre-treatment layer formed on the lithium metal, the pre-treatment layer having a thickness of 50 to 5000Å and including a lithium ion conductive material with an ionic conductivity of at least  $1 \times 10^{-10}$  S/cm; and

a protection layer for the lithium metal comprising  $\text{Li}_a\text{PO}_b\text{N}_c$ , where a is 2 to 4, b is 3 to 5, and c is 0.1 to 0.9.

6. (Original) The negative electrode of claim 5, wherein the protection layer for the lithium metal comprises  $\text{Li}_{2.9}\text{PO}_{3.3}\text{N}_{0.46}$ .

7. (Original) The negative electrode of claim 1, wherein the protection layer for the lithium metal has a thickness of 1000Å to 50µm.

8. (Original) The negative electrode of claim 1, wherein the protection layer is formed on the pre-treatment layer.

9. (Currently Amended) A method of preparing a negative electrode for a lithium sulfur battery comprising:

depositing a pre-treatment layer on a lithium metal under an inert gas atmosphere, the pre-treatment layer being deposited to a thickness ranging from about 50 to about 5000Å and including a lithium ion conductive material with an ionic conductivity of at least  $1 \times 10^{-10}$  S/cm, wherein the lithium ion conductive material is  $\text{Li}_x\text{PO}_y$ , where  $2 < x < 4$  and  $3 < y < 5$ ; and depositing a protection layer for the lithium metal on the pre-treatment layer.

10. (Canceled).

**Appln No. 10/688,781**

**Amdt date March 19, 2007**

**Reply to Office action of December 18, 2006**

11. (Previously Presented) The method of claim 9, wherein the lithium ion conductive material is  $\text{Li}_3\text{PO}_4$ .

12. (Original) The method of claim 9, wherein the ionic conductivity of the lithium ion conductive material ranges from  $1 \times 10^{-10}$  S/cm to  $1 \times 10^{-6}$  S/cm.

13. (Original) The method of claim 9, wherein the inert gas is selected from the group consisting of helium gas, neon gas, and argon gas.

14. (Currently Amended) A method of preparing a negative electrode for a lithium sulfur battery comprising:

depositing a pre-treatment layer on a lithium metal under an inert gas atmosphere, the pre-treatment layer being deposited to a thickness ranging from about 50 to about 5000Å and including a lithium ion conductive material with an ionic conductivity of at least  $1 \times 10^{-10}$  S/cm; and

depositing a protection layer for the lithium metal on the pre-treatment layer, wherein the protection layer for the lithium metal comprises  $\text{Li}_a\text{PO}_b\text{N}_c$ , where a is 2 to 4, b is 3 to 5, and c is 0.1 to 0.9.

15. (Original) The method of claim 14, wherein the protection layer for the lithium metal comprises  $\text{Li}_{2.9}\text{PO}_{3.3}\text{N}_{0.46}$ .

16. (Original) The method of claim 9, wherein the protection layer for the lithium metal has a thickness of 1000Å to 50µm.

**Appln No. 10/688,781**

**Amdt date March 19, 2007**

**Reply to Office action of December 18, 2006**

17. (Original) A lithium sulfur battery comprising:  
a negative electrode comprising a lithium metal, a pre-treatment layer formed on the lithium metal, having a thickness of 50 to 5000Å and including a lithium ion conductive material with an ionic conductivity of at least  $1 \times 10^{-10}$  S/cm, and a protection layer for the lithium metal;  
a positive electrode comprising a positive active material selected from the group consisting of elemental sulfur, sulfur-based compounds, and mixtures thereof; and  
an electrolyte.
18. (Original) The lithium sulfur battery of claim 17, wherein the lithium ion conductive material is  $\text{Li}_x\text{PO}_y$ , where  $2 < x < 4$  and  $3 < y < 5$ .
19. (Original) The lithium sulfur battery of claim 18, wherein the lithium ion conductive material is  $\text{Li}_3\text{PO}_4$ .
20. (Original) The lithium sulfur battery of claim 17, wherein the ionic conductivity of the lithium ion conductive material ranges from  $1 \times 10^{-10}$  S/cm to  $1 \times 10^{-6}$  S/cm.
21. (Original) The lithium sulfur battery of claim 17, wherein the protection layer for the lithium metal comprises  $\text{Li}_a\text{PO}_b\text{N}_c$ , where a is 2 to 4, b is 3 to 5, and c is 0.1 to 0.9.
22. (Original) The lithium sulfur battery of claim 21, wherein the protection layer for the lithium metal comprises  $\text{Li}_{2.9}\text{PO}_{3.3}\text{N}_{0.46}$ .
23. (Original) The lithium sulfur battery of claim 17, wherein the protection layer for the lithium metal has a thickness of 1000Å to 50μm.

**Appln No. 10/688,781**

**Amdt date March 19, 2007**

**Reply to Office action of December 18, 2006**

24. (Original) The lithium sulfur battery of claim 17, wherein the protection layer is formed on the pre-treatment layer.